Isolating direct photons
Measureing jets
1st draft dA section

Richard Seto
University of CA, Riverside
Muon Trigger upgrade meeting
Nov 24, 2003

Schedule to LOI for RKS

- ✓ Nov 29– Nosecone simulations done
- Dec 1 – first draft of dA section to group
  - http://www.phenix.bnl.gov/phenix/WWW/p/draft/seto/upgrades/muonnose/LOI/
- Dec 1 – Cost and schedule to RKS
  - Edward – nosecone, Matthias – muons, Ken-trigger
    - http://www.phenix.bnl.gov/phenix/WWW/p/draft/seto/upgrades/muonnose/LOI/costs/
- Dec 3 – Cost and schedule to group
- Dec 1 – UIUC pre-proposal/ to chair
- Dec 8 – to uiuc
- Dec 8 – LOI to PHENIX

  - Blue – RKS, red – others, black – everybody, green – UIUC folks

Update on simulations for nosecone

- How well can I use find the direct photon?
  - Efficiency/ background
  - Cuts (pt, isolation)
- How well can I measure x_1, x_2, Q^2
- How well can I measure the Jet
  - Muon stuff, dir photon in central arm, measureing kinematics etc
- Everything at the Hijing/pythia level, smearing tracks/photons
  - Note- I will be sending out results as they come

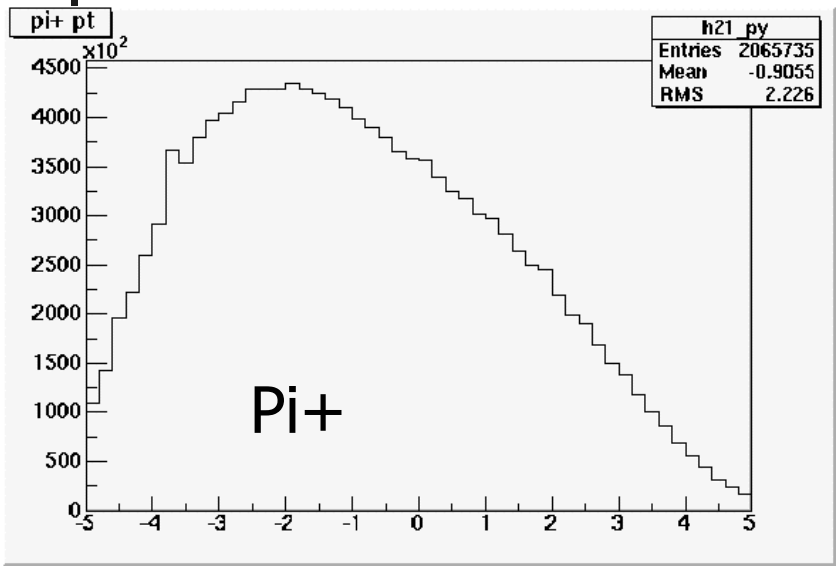
Finding direct photons in the nemc

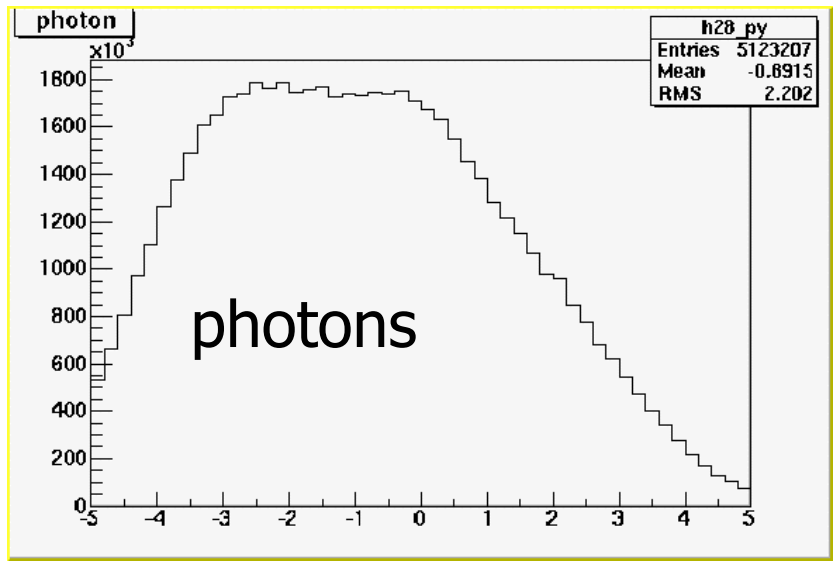
- 2 handles
  - Use isolation of direct photon
  - Use spacial resolution to identify pi0's
- Hijing
  - Require particles in nemc
  - Merge photons
    - r<30mr(r<1-2cm)
    - r<6mr (r<3-4mm)
  - Look at energy in $d\eta d\phi$~0.26 (tried a variety – UA2)
    - Require < 200 MeV pt (will be ~1-2 GeV) – basically nothing NO TRACKS – will be helped by SI-endcap
- Helped by STAR proposal

Calculating cross section

- Throw dir photon
  - Default - > 2.25 GeV
  - Use > 1.25 GeV
- Throw background
  - Central b<1
- Nn cross sections
  - 41 mb (inelastic)
  - Dir photon > 2.25 ~0.001mb
  - Dir photon > 1.25 ~0.0059 mb
- $A^{1/3}$ ~6
- So for dir photon > 1.25 the ratio is
- $(197)^{1/3}.0059/41=8.6e-4$
- Or 1160 background for every dir photon

Sanity check

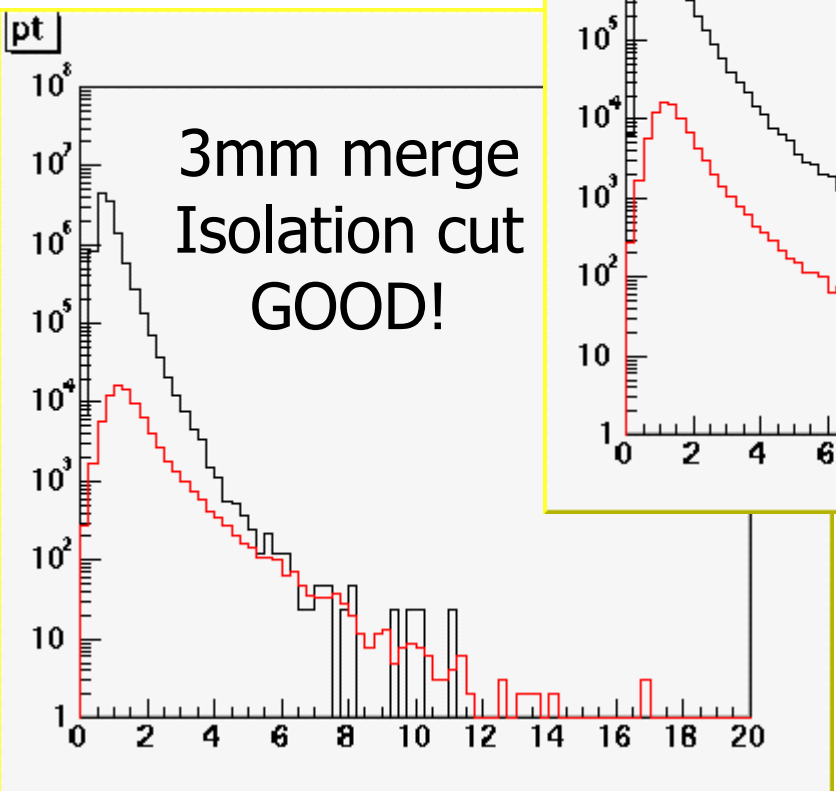


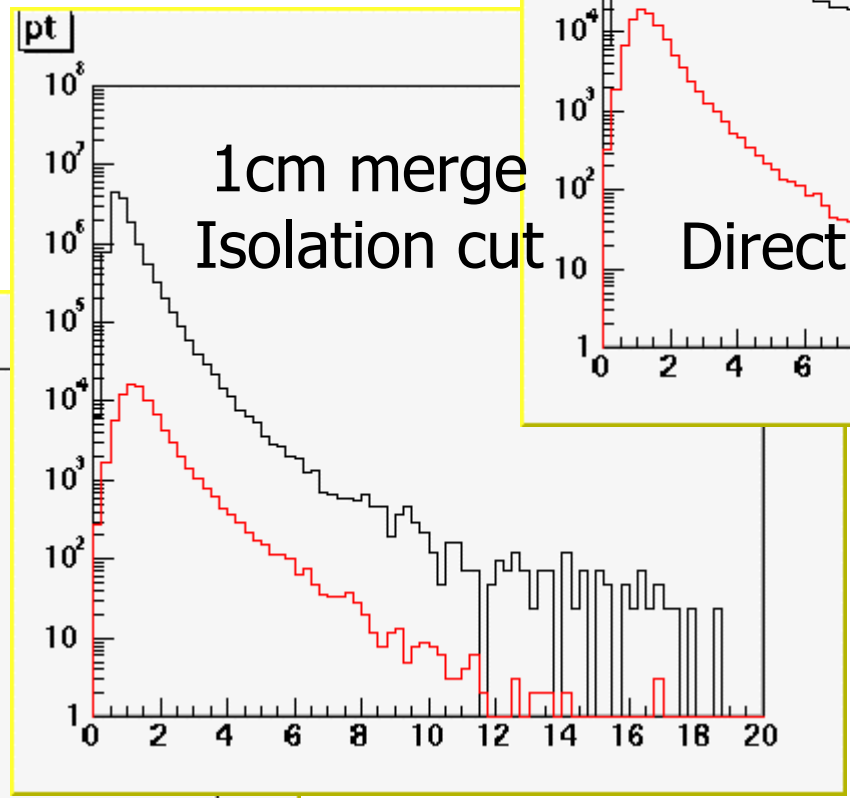


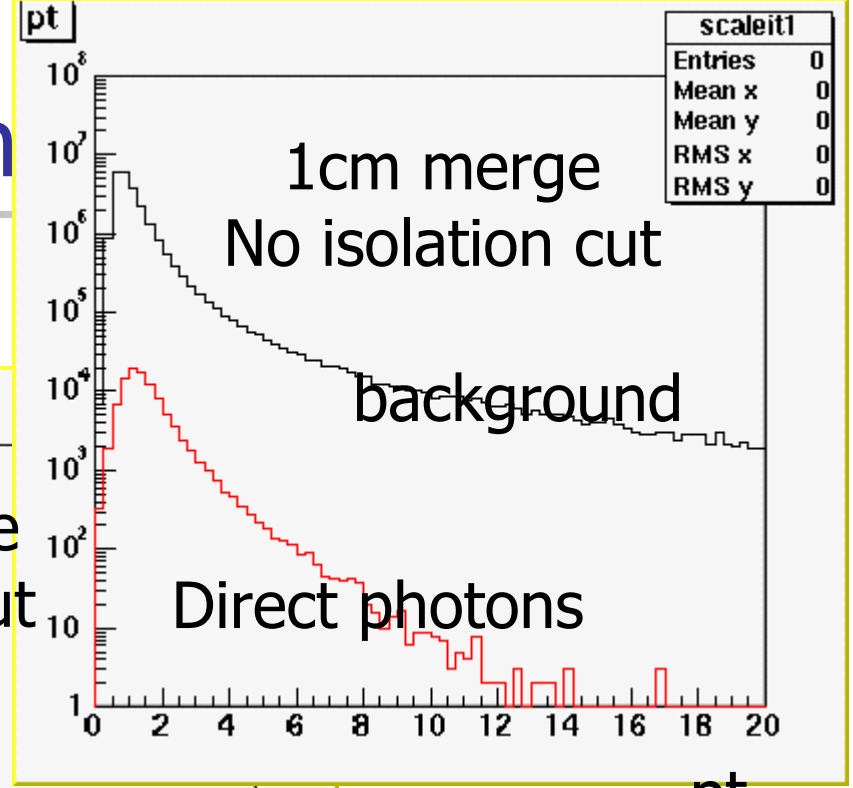
- 100 K events
  - 1 dir photon/event
- 4e5*4=1.6e6
- 4x pi+=photons – good

- Dndy~5*4e5/1e5*2 ~40
- ~800(AA)/400(npAA)*7=
- 14??

Finding the photon

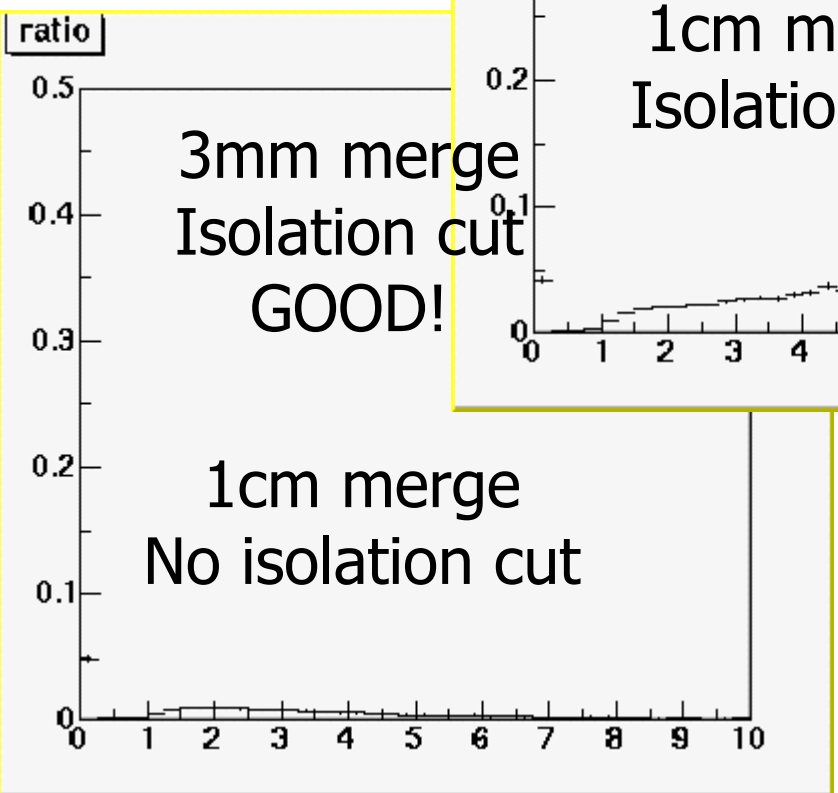


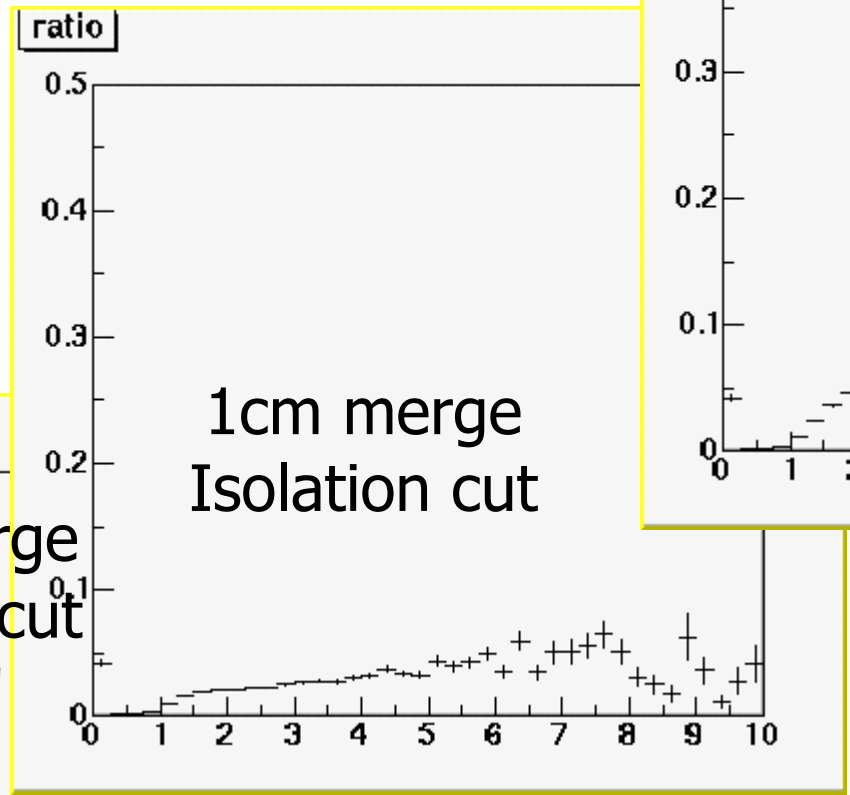


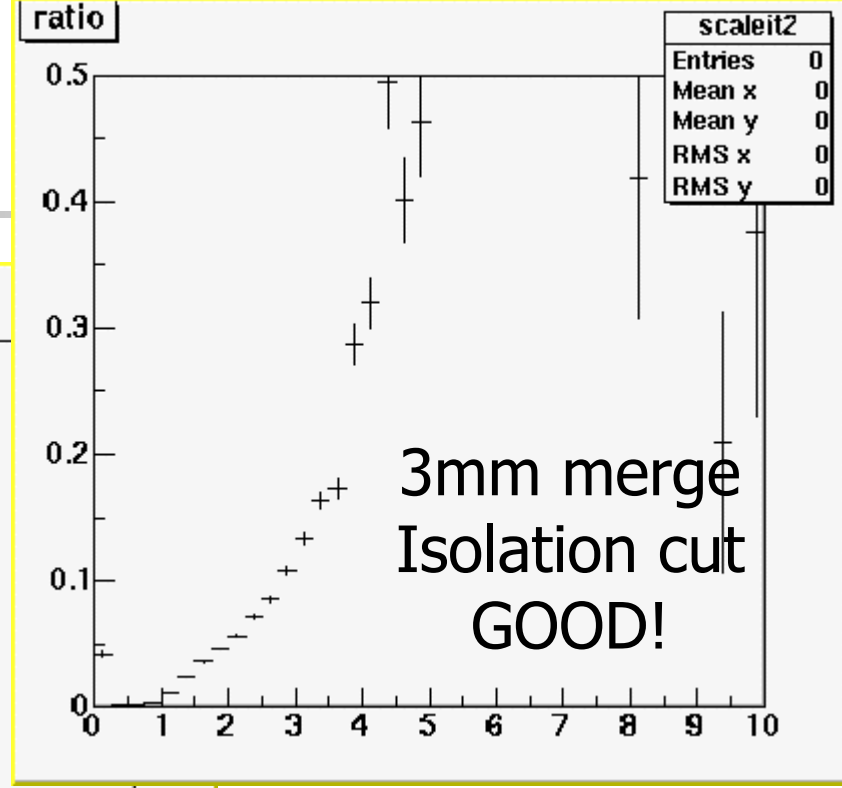


R. Seto

Ratio gamma/bkg

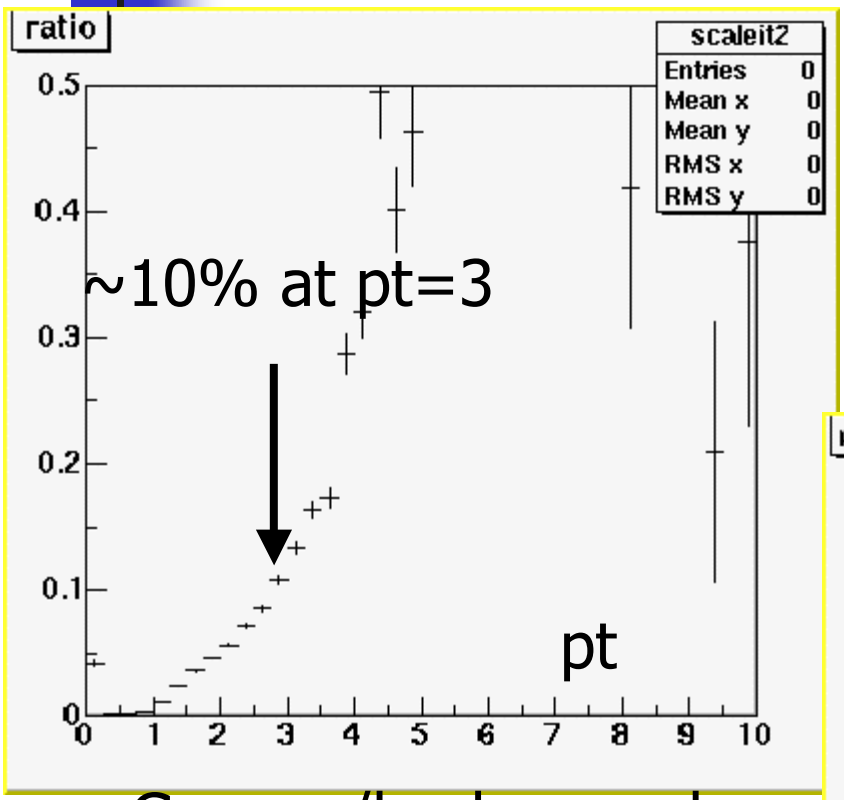




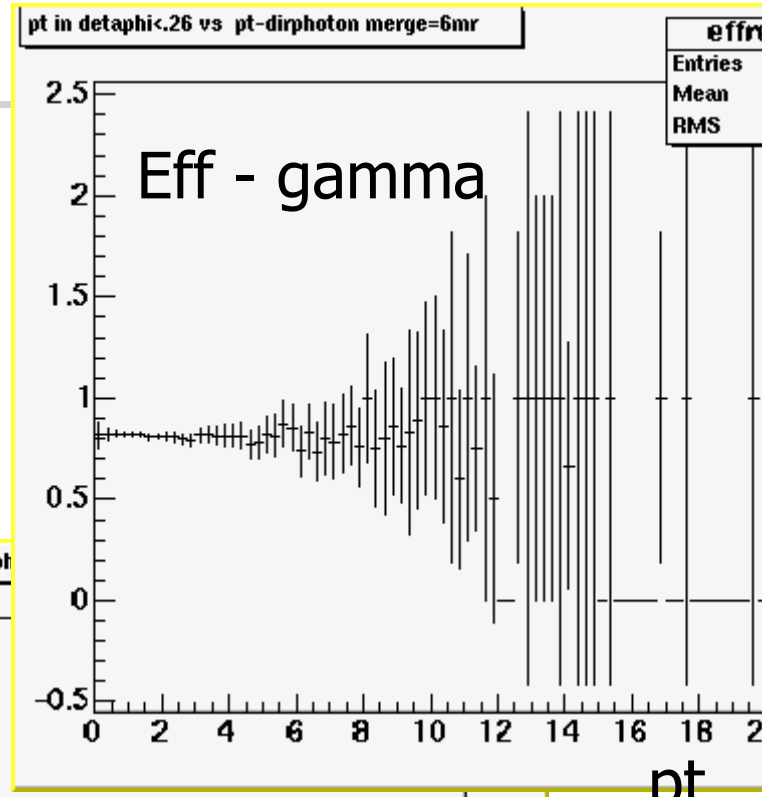


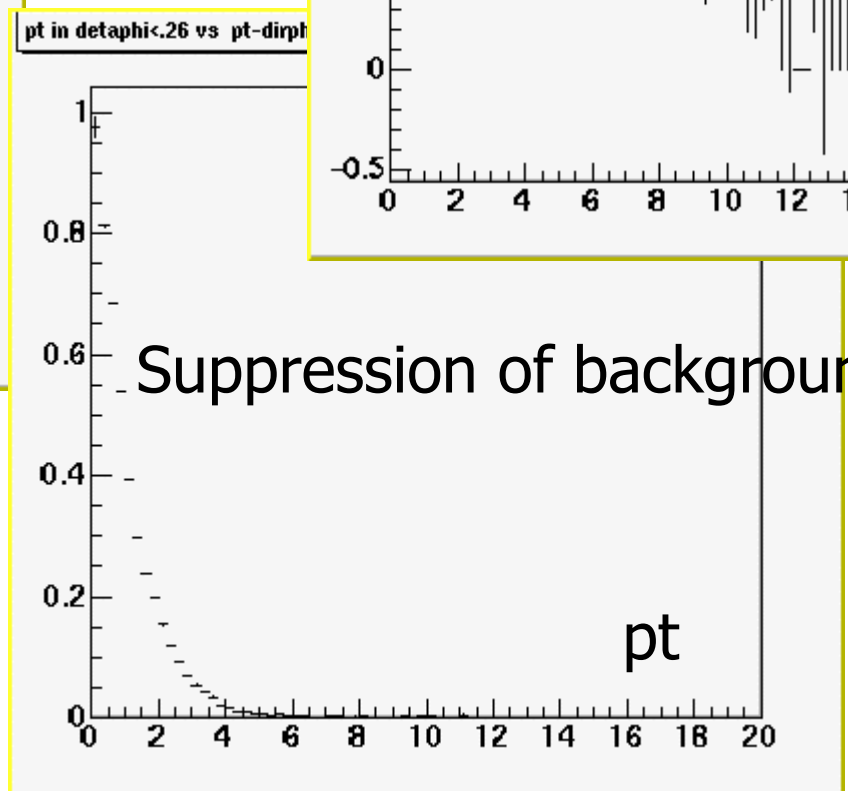
R. Seto

Ratios and efficiecies



Gamma/background





Defining a jet

- Standard jet algorithm

Take $R = d\eta d\varphi = 0.7$

E_t is for tower or particle

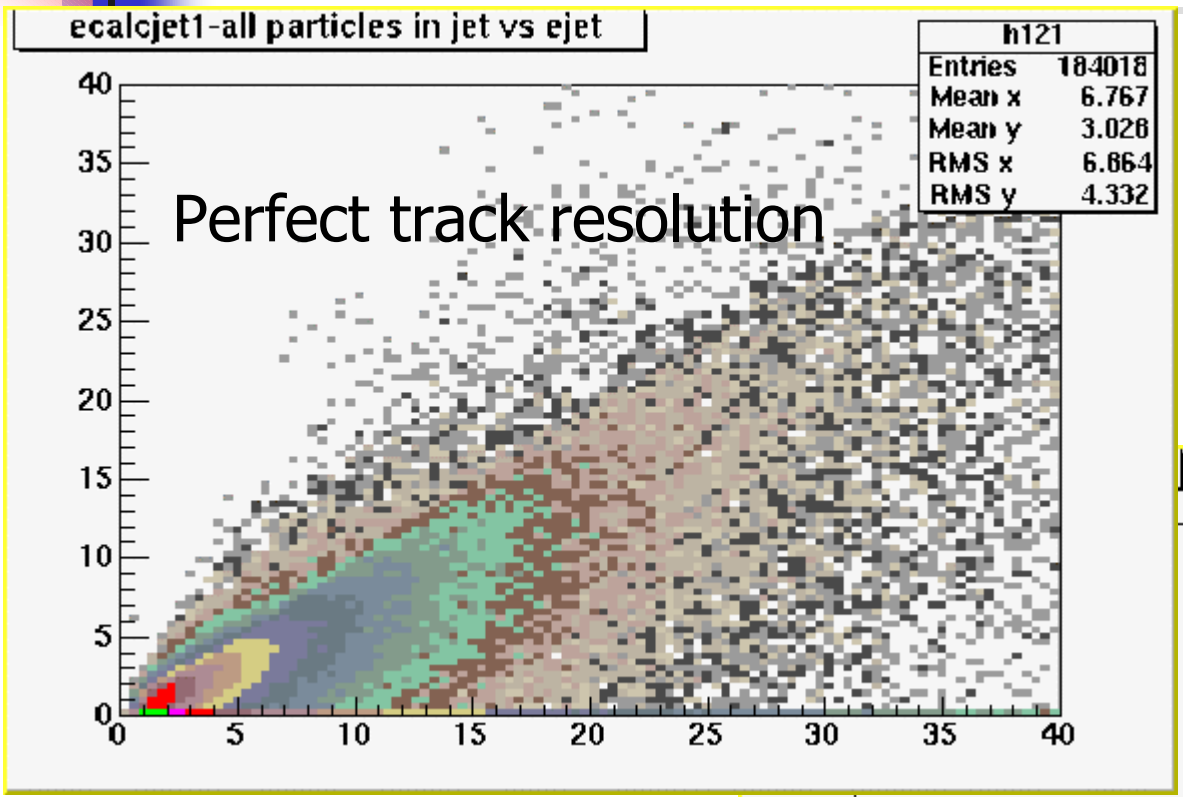
$$E_T = \sum_{i \in R} E_{Ti}$$

$$\eta_{Jet} = \frac{1}{E_T} \sum_{i \in R} E_{Ti} \eta_i$$

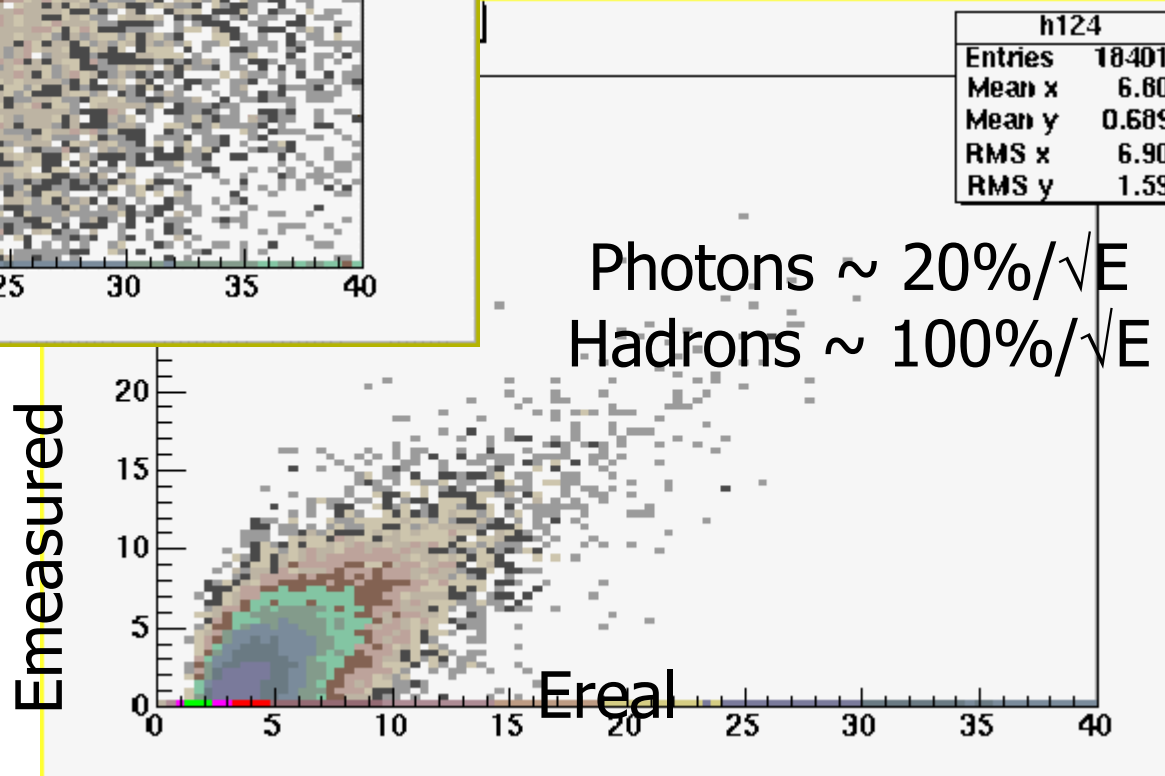
$$\phi_{Jet} = \frac{1}{E_T} \sum_{i \in R} E_{Ti} \phi_i$$

- For now I cheat- I know the eta, phi of the jet and take anything within R

Measuring jet energy

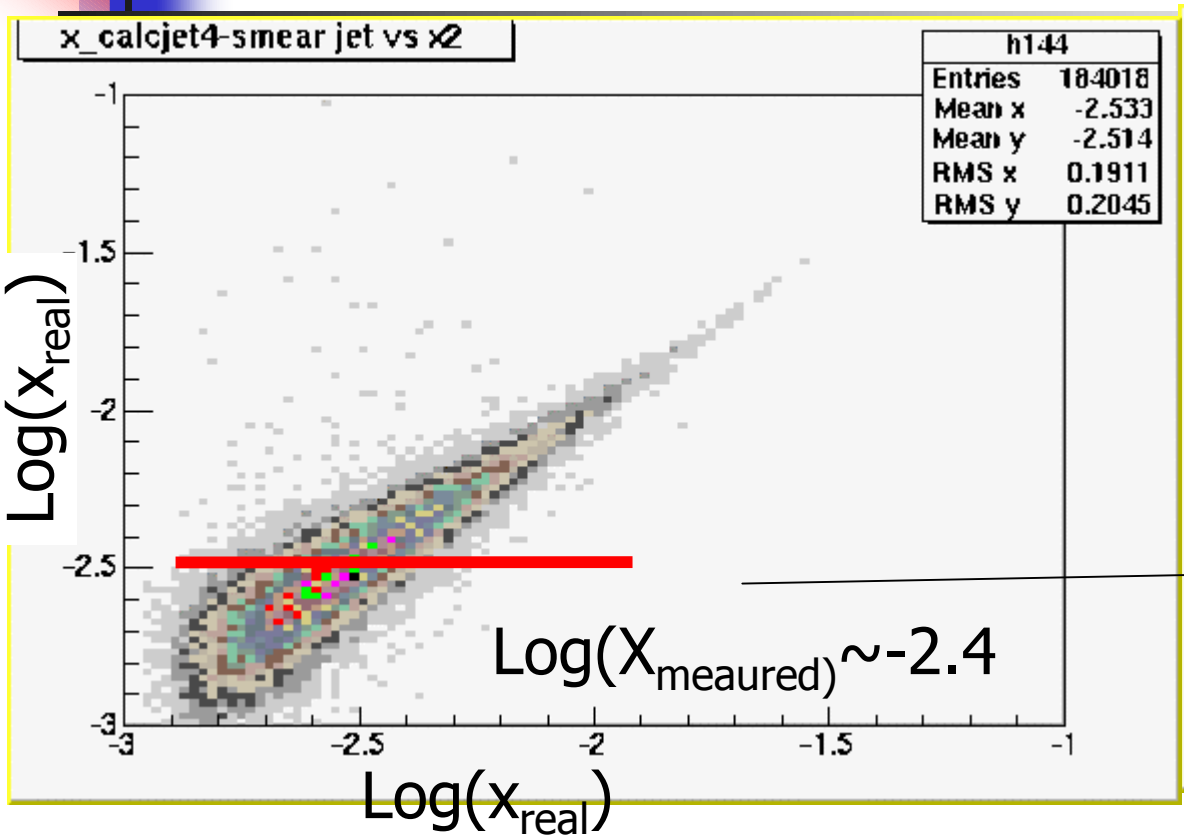


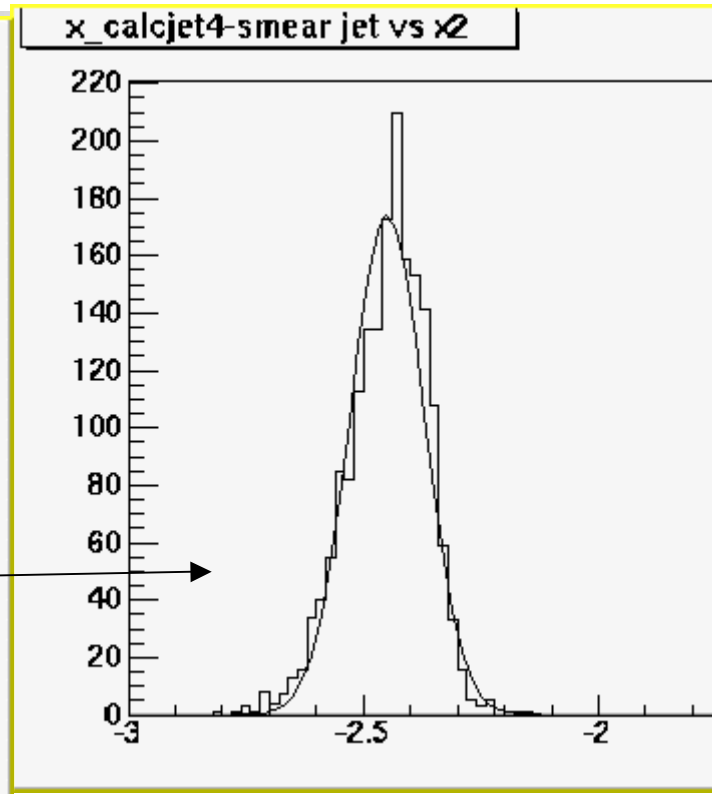
- I logzed these
- Now so good? But how well can we measure x?



- Require center of jet in nemc
- Measure only tracks in nemc

Measureing x

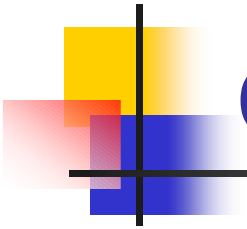




$$x_{1,2} = \frac{p_T}{\sqrt{s}}\left(e^{\pm y_\gamma} + e^{\pm y_{Jet}}\right)$$

Log(x)~-2.4
x=.0038±.0015

assume $\eta = y$



Conclude

- So far it looks as if we can measure the direct photons
- It also looks like we will have a reasonable measurement of x_2